

Subpart 54.23—Fabrication by Brazing

§ 54.23-1 Scope (modifies UB-1).

(a) Fabrication by brazing shall be in accordance with the provisions of this part and with part 57 of this subchapter.

[CGFR 69-127, 35 FR 9977, June 17, 1970]

Subpart 54.25—Construction With Carbon, Alloy, and Heat Treated Steels

§ 54.25-1 Scope.

(a) The carbon, alloy, and heat treated steels used in construction of pressure vessels and parts shall be as indicated in section VIII of the ASME Code except as noted otherwise in this subpart.

§ 54.25-3 Steel plates (modifies UCS-6).

(a) The steels listed in UCS-6(b) and UCS-6(c) of the ASME Code will be allowed only in Class III pressure vessels (see Table 54.01-5(b)).

§ 54.25-5 Corrosion allowance (replaces UCS-25).

(a) The corrosion allowance shall be as required in § 54.01-35 in lieu of requirements in UCS-25 of the ASME Code.

§ 54.25-7 Requirement for postweld heat treatment (modifies UCS-56).

(a) Postweld heat treatment is required for all carbon and low alloy steel Class I, I-L, and II-L vessels regardless of thickness. (Refer to Table 54.01-5(b) for applicable requirements.)

(b) Cargo tanks which are fabricated of carbon or low alloy steel as Class II pressure vessels, designed for pressures exceeding 100 pounds per square inch gage and used in the storage or transportation of liquefied compressed gases shall be postweld heat treated regardless of thickness.

[CGFR 69-127, 35 FR 9977, June 17, 1970]

§ 54.25-8 Radiography (modifies UW-11(a), UCS-57, UNF-57, UHA-33, and UHT-57).

(a) Full radiography is required for all Class I and Class I-L vessels regard-

less of thickness. (Refer to Table 54.01-5(b) for applicable requirements.)

(b) Class II-L vessels shall be spot radiographed. The exemption provided in UW-11(c) of the ASME Code does not apply. (Refer to Table 54.01-5(b) for applicable requirements.)

(c) Each butt welded joint in a Class II or III pressure vessel cargo tank must be spot radiographed, in accordance with UW-52, regardless of diameter or thickness, and each weld intersection or crossing must be radiographed for a distance of at least 10 thicknesses from the intersection.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 85-061, 54 FR 50964, Dec. 11, 1989]

§ 54.25-10 Low temperature operation—ferritic steels (replaces UCS-65 through UCS-67).

(a) *Scope.* (1) This section contains requirements for pressure vessels and nonpressure vessel type tanks and associated secondary barrier, as defined in § 38.05-4 and § 154.7 of this chapter, and their parts constructed of carbon and alloy steels which are stressed at operating or hydrostatic test temperatures below 0 °F.

(2) The service temperature is the minimum temperature of a product at which it may be contained, loaded and/or transported. However, the service temperature shall in no case be taken higher than given by the following formula:

$$t_s = t_w - 0.25(t_w - t_B)$$

where:

t_s =Service temperature.

t_w =Boiling temperature of gas at normal working pressure of container but not higher than +32 °F.

t_B =Boiling temperature of gas at atmospheric pressure.

Only temperatures due to refrigerated service usually need to be considered in determining the service temperature, except pressure vessel type cargo tanks operating at ambient temperatures must meet paragraph (d) of this section. "Refrigerated service", as used in this paragraph, means a service in which the temperature is controlled by the process and not by atmospheric conditions.

(b) *Specifications.* Materials used in the construction of vessels to operate

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below 0 °F. (but not below the designated minimum service temperature) shall conform to a specification given in Table UCS-23 in the ASME Code and the following additional requirements:

NOTE: For high alloy steels refer to § 54.25-15. For heat treated steels refer to § 54.25-20.

(1)(i) For minimum service temperatures not lower than -67 °F., ferritic steels shall be made with fine grain practice and shall have an austenitic grain size of 5 or finer, and shall be normalized. Consideration will be given to other heat treatments. Refer to § 57.03-1(d) of this subchapter. Plate for pressure vessel applications shall conform to the requirements of ASTM A 20 (incorporated by reference, see § 54.01-1). It may be produced by the open hearth, basic oxygen or electric furnace process and shall conform to the requirements of Table 54.25-10(b)(1). (Other alloying elements may only be present in trace amounts.)

(ii) Mechanical properties shall be within the following limits:

Ultimate strength —58,000¹–85,000¹ p.s.i.
Yield strength —Minimum 35,000 p.s.i.
..... —Maximum 80 percent of ultimate.
Elongation minimum —20 percent in 8 inches, or
..... —24 percent in 2 inches, or
..... —22 percent in 5.65 √A, where "A"
is the test specimen cross sectional area.

TABLE 54.25-10(B)(1)

Minimum service ¹ temperature °F	Max. C ¹ percent	Manganese range ¹ per- cent
-30	0.20	0.70-1.35
-5016	1.15-1.50
-6712	1.30-1.60

¹ At service temperatures intermediate between those specified, intermediate amounts of carbon and manganese will be allowed (in proportion to the actual service temperature variation from that listed), provided all other chemical and mechanical properties specified for steels in this temperature range are satisfied.

	Range per- cent
Si	0.10-0.50
	Maximum
S	0.035
P	0.035
Ni	0.80
Cr	0.25
Mo	0.08
Cu	0.035
Nb	0.05
V	0.08

(2) For minimum service temperature below -67 °F., but not below the des-

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ignated minimum service temperature, ferritic steels shall be normalized, low carbon, fully killed, fine grain, nickel alloy type, conforming to any one of the specifications in Table 54.25-10(b)(2). Consideration will be given to other heat treatments. Refer to § 57.03-1(d) of this subchapter for quenched and tempered steels. The ultimate and yield strengths shall be as shown in the applicable specification and shall be suitable to the design stress levels adopted. The service temperature shall not be colder than the minimum specified in Table 54.25-10(b)(2) for each steel.

TABLE 54.25-10(B)(2)

Steel	Minimum service temperature
A-203, 2¼ percent, Ni, normalized.	-80 °F. for Grade A. -75 °F. for Grade B.
A-203, 3½ percent, Ni, normalized.	-130 °F. for Grade D. -110 °F. for Grade E.
5 percent Ni, normalized	Dependent on chemical and physical properties.

(3) The materials permitted under paragraphs (b) (1) and (2) of this section shall be tested for toughness in accordance with and shall satisfy the applicable requirements of subpart 54.05.

(4) Welded pressure vessels or non-pressure vessel type tanks and associated secondary barriers, as defined in § 38.05-4 of subchapter D (Tank Vessels) of this chapter shall meet the toughness requirements of subparts 57.03 and 57.06 of this subchapter with regard to weld procedure qualifications and production testing.

(5) The material manufacturer's identification marking required by the material specification shall not be die-stamped on plate material less than one-fourth inch in thickness.

(c) *Design.* Pressure vessels must meet the requirements for Class I-L and II-L construction. (See Table 54.01-5(b) for applicable requirements). Except as permitted by § 54.05-30, the allowable stress values used in the design of low temperature pressure vessels may not exceed those given in Table UCS-23 of the ASME Code for temperatures of 0 °F. to 650 °F. For materials not listed in this Table allowable stress values are determined in accordance with Appendix P of Section VIII of the ASME Code.

(d) Weldments and all materials used in pressure vessel type cargo tanks operating at ambient temperatures and constructed of materials listed in Table UCS-23 must pass Charpy impact tests in accordance with UG-84 at a temperature of -20°F or colder, except as provided by paragraphs (d)(1), (d)(2), and (d)(3) of this section.

(1) Charpy impact tests are not required for any of the following ASTM materials if the thickness for each is $\frac{3}{8}$ inch or less, unless otherwise indicated:

- (i) A-182, normalized and tempered.
- (ii) A-302, Grades C and D.
- (iii) A-336, Grades F21 and F22 that are normalized and tempered.
- (iv) A-387, Grades 21 and 22 that are normalized and tempered.
- (v) A-516, Grades 55 and 60.
- (vi) A-533, Grades B and C.
- (vii) All other plates, structural shapes and bars, and other product forms, except for bolting, if produced to a fine grain practice and normalized.

(2) Charpy impact tests are not required for any of the following ASTM materials if the thickness for each is $1\frac{1}{4}$ inch or less:

- (i) A-203.
- (ii) A-508, Class 1.
- (iii) A-516, normalized.
- (iv) A-524.
- (v) A-537.
- (vi) A-612, normalized.
- (vii) A-662, normalized.
- (viii) A-724, normalized.

(3) Charpy impact tests are not required for any of the following bolt materials:

- (i) A-193, Grades B5, B7, B7M, and B16.
- (ii) A-307, Grade B
- (iii) A-325, Type 1.
- (iv) A-449.

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGFR 69-127, 35 FR 9977, June 17, 1970; CGD 73-133R, 39 FR 9178, Mar. 8, 1974; CGD 74-289, 44 FR 26007, May 3, 1979; CGD 77-069, 52 FR 31626, Aug. 21, 1987; CGD 85-061, 54 FR 50964, Dec. 11, 1989; USCG-1999-5151, 64 FR 67178, Dec. 1, 1999; USCG-2000-7790, 65 FR 58460, Sept. 29, 2000]

§ 54.25-15 Low temperature operation—high alloy steels (modifies UHA-23(b) and UHA-51).

(a) Toughness tests for the materials listed in UHA-51(a) of the ASME Code

for service temperatures below -425°F ., UHA-51(b)(1) through (5) for service temperatures below 0°F ., and UHA-51(c) for all service temperatures, shall be performed in accordance with the requirements of subpart 54.05. These requirements are also applicable to non-pressure vessel type, low temperature tanks and associated secondary barriers, as defined in § 38.05-4 in subchapter D (Tank Vessels) of this chapter. Such tests are required regardless of the vessel's design stress. Service temperature is defined in § 54.25-10(a)(2).

(b) Materials for pressure vessels with service temperatures below -320°F shall be of the stabilized or low carbon (less than 0.10 percent) austenitic stainless steel type, produced according to the applicable specifications of Table UHA-23 of the ASME Code. These materials and their weldments shall be tested for toughness according to the requirements of subpart 54.05 except that the Charpy V-notch testing acceptance criteria will be in accordance with UHT-6(a)(4) and (5) of the ASME Code."

(c) Except as permitted by § 54.05-30, the allowable stress values used in the design of low temperature pressure vessels may not exceed those given in Table UHA-23 of the ASME Code for temperatures of -20°F . to 100°F .

[CGFR 68-82, 33 FR 18828, Dec. 18, 1968, as amended by CGD 73-133R, 39 FR 9178, Mar. 8, 1974; CGD 73-254, 40 FR 40164, Sept. 2, 1975]

§ 54.25-20 Low temperature operation—ferritic steels with properties enhanced by heat treatment (modifies UHT-5(c), UHT-6, UHT-23, and UHT-82).

(a) For service temperatures below 0°F . but not below the designated minimum service temperature, steel conforming to the specifications of Table 54.25-20(a) may be used in the fabrication of pressure vessels and nonpressure vessel tanks and associated secondary barriers, as defined in § 38.05-4 of subchapter D (Tank Vessels) of this chapter. The ultimate and yield strengths shall be as shown in the applicable specification and shall be suitable for the design stress levels adopted. The service temperature shall not